DTIC FILE COPY

(4)

A RAND NOTE

AD-A212 211

Weight Problems and Attrition of High-Quality Military Recruits

Richard Buddin

June 1989

DTIC
ELECTE
SEP 13 1989
S D
B

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

RAND

89 9 12 058

The research described in this report was sponsored by the Office of the Assistant Secretary of Defense for Force Management and Personnel under RAND's National Defense Research Institute, a Federally Funded Research and Development Center supported by the Office of the Secretary of Defense, Contract No. MDA903-85-C-0030.

The RAND Publication Series: The Report is the principal publication documenting and transmitting RAND's major research findings and final research results. The RAND Note reports other outputs of sponsored research for general distribution. Publications of The RAND Corporation do not necessarily reflect the opinions or policies of the sponsors of RAND research.

Published by The RAND Corporation
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90406-2138

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: N-2847-FMP 2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE and Subtitle: Weight Problems and Attrition of High-Quality Military Recruits	5. TYPE OF REPORT & PERIOD COVERED: Interim 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Richard Buddin	8. CONTRACT OR GRANT NUMBER(s): MDA903-85-C-0030
9. PERFORMING ORGANIZATION NAME AND ADDRESS: The RAND Corporation, 1700 Main Street, Santa Monica, CA 90406	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: Office, Assistant Secretary of Defense, Force Management and Personnel, Washington, DC 20301	12. REPORT DATE: June 1989 13. NUMBER OF PAGES: 35
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

No restrictions

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Recruits
Physical Fitness
Body Weight
Military Training
Attrition

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

See reverse side

DD FORM 1 JAN 73 1473

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Despite recent interest in the physical standards for screening recruits in the Armed Services, few studies have been done on the relationship between recruit weight problems and military personnel attrition. This Note examines the implications of physical standards for restricting the accession of recruits with weight problems and considers whether potentially overweight recruits who are allowed to enlist have higher rates of premature separation from the military than recruits from average weight categories. It presents separate analyses of the relationship between attrition and weight, by Service, gender, and training phase of the enlisted term. The findings indicate that medically overweight men--those with substantially above average body mass--have much higher training attrition rates than recruits who have no weight problems. After initial military training, weight differences have much less effect on attrition. The author suggests that the Services consider some changes in physical standards and evaluate whether special programs might be cost-effective in mitigating the attrition problems of overweight men in the military. Weight differences among women enlistees have little effect on their attrition rates, perhaps because current physical standards are much more restrictive for women than for men. (See also R-3539.)

A RAND NOTE

N-2847-FMP

Weight Problems and Attrition of High–Quality Military Recruits

Richard Buddin

June 1989

Prepared for
The Office of the Assistant Secretary of Defense
for Force Management and Personnel

RAND

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

PREFACE

Despite recent interest in the physical standards for screening recruits in the Armed Services, few studies have been done on the relationship between recruit weight problems and military personnel attrition. This Note examines the implications of physical standards for restricting the accession of recruits with weight problems and whether potentially overweight recruits who are allowed to enlist subsequently have higher rates of premature separation from the military than recruits from average weight categories. Separate analyses of the relationship between attrition and weight are performed by Service, gender, and training phase of the enlisted term.

The research reported here is an adjunct to a larger study: Richard Buddin, *Trends in Attrition of High-Quality Military Recruits*, The RAND Corporation, R-3539-FMP, August 1988. The purpose of that study was to determine what factors might be responsible for the unexpected rise in attrition rates during a period when recruit quality improved. It examined the attrition trends over four cohorts, FY1982 through FY1985, at the basic-training, technical-training, and post-training levels for all four Services, looking at such variables as occupations, recruit characteristics, training bases, and bodymass.

The research was sponsored by the Directorate for Accession Policy, Office of the Assistant Secretary of Defense for Force Management and Personnel, within RAND'S National Defense Research Institute, an OSD-sponsored, federally funded research and development center. It was conducted by the Attrition Policy project, part of RAND'S Defense Manpower Research Center.

Accession For
NTIS GRA&I ☑
DTIC TAB ☐
Unannounced ☐
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

QUALITY INSPECTED 4

SUMMARY

Military weight standards for potential male recruits exclude only about 4 percent of the general 17- to 22-year-old population from military service. About 14 percent of this population is overweight by common epidemiological or medical standards, so there is considerable variation in the weight adjusted for height or bodymass of an entry cohort of male recruits. This study examines the relationship between recruit bodymass and military attrition and shows that medically overweight men—those with substantially above average bodymass—have much higher training attrition rates than recruits who have no weight problems. In the Army and Marine Corps, some of the overweight men have basic training attrition rates that are two to three times as large as those of the average recruit. Overweight men do not fare as badly in the Navy and Air Force, but they do have attrition rates several percentage points above average.

After initial military training, weight differences have much less effect on attrition. In the Navy, Air Force, and Marine Corps, male post-training attrition rates do not differ significantly with bodymass. Post-training losses of Army men at the upper end of the eligible range are 1.25 times the average, whereas training losses at the upper end of the range were three times the average. Apparently, either the physical training in basic and technical (advanced individual) training succeeds in weeding out those recruits with serious weight problems, or weight problems are less important in the less physically demanding post-training phase of the enlistment term.

The Services should consider some changes in physical standards and evaluate whether special programs might be cost-effective in mitigating the attrition problems of overweight men in the military. Tighter male physical standards could substantially reduce the military eligible enlistment pool, thereby either increasing the cost of recruiting the desired number of high-quality soldiers or filling a larger portion of the enlistment requirement with low-quality personnel who satisfied the new physical standard. High-quality, medically overweight male accessions may be no greater attrition risks than their potential low aptitude or nongraduate replacements in a regime of tighter physical standards.

Further research is needed to isolate the specific reasons for high attrition rates among medically overweight recruits and to investigate whether these recruits could be

targeted with special attention to ease their attrition problems. Although the evidence is not conclusive, Army experience suggests that special programs might substantially diminish the attrition rates of overweight recruits. Changes in Army attrition management and practices have reduced the training attrition rates of overweight men in FY85 below those of many nonoverweight men in earlier cohorts. Although overweight men still have above average training attrition rates, there has been a large relative improvement under the new policies. The Army experience highlights the importance of evaluating a change in recruitment standards in the context of other institutional changes in practices. Under FY85 policies and practices, tighter physical standards would presumably reduce training attrition rates by less than the standards in FY83 policies and practices. Unfortunately, we cannot document why overweight men did relatively better in FY85, so we cannot predict whether the change will continue.

Weight differences among women enlistees have little effect on their attrition rates, in part perhaps because current physical standards are much more restrictive for women than for men. About 20 percent of the general 17- to 22-year old women in the civilian population are ineligible under military weight standards, while 14 percent of this population are medically overweight. Consequently, there is considerably less variation in the bodymass of female recruits than in that for male recruits, and little reason to expect that high bodymass female recruits would have attrition rates above those of average bodymass recruits. Lax enforcement of nominal military weight standards for women has allowed substantial numbers of women to enlist who were within 5 to 10 pounds of the standard. Women who enlisted with weight standard waivers do not have attrition rates significantly higher than those who meet the nominal standard.

ACKNOWLEDGMENTS

The author is grateful to Dr. Steven Sellman, Director for Accession Policy in the Office of the Assistant Secretary of Defense for Force Management and Personnel, for his support and encouragement of this research. Dr. Zahava Doering, formerly of the Defense Manpower Data Center, and Colonel Frank Terrell from the Directorate for Accession Policy provided useful comments and direction as project officers for the study. The author also benefited from discussions of preliminary results with Major Denny Eakle-Cardinal, Lieutenant Colonel William Carr, Lieutenant Colonel David McKenzie, and Mr. Robert Nemetz of the Office of the Assistant Secretary of Defense for Force Management and Personnel and with Drs. Michael Laurence and Bette Mahoney of the Defense Manpower Data Center. Mr. Les Willis of the Defense Manpower Data Center created the data file for the study. Among RAND colleagues, Rick Eden, Glenn Gotz, James Hosek, Judith Lewis, and Alvin Ludwig provided useful comments on an earlier draft. Stephen Carroll and John Winkler provided thoughtful technical reviews.

CONTENTS

FIGURES

TABLE

I. INTRODUCTION AND APPROACH

BACKGROUND

Despite recent interest in the physical standards for screening recruits in the Armed Services (Laurence, 1985, 1987, 1988), little analysis has been done on the relationship between recruit weight problems and military attrition. This analysis uses data on recruit height and weight to compute a variable termed *bodymass* and assesses whether it has any effect on recruit attrition. Recruit bodymass is a previously unanalyzed variable that appears to affect attrition at different training levels.

Being overweight could make it more difficult for a recruit to keep pace in some of the more physically demanding training programs. Overweight recruits would therefore be more likely to be high attrition risks, especially during basic training. If so, the Services might want to consider some changes in physical standards or target overweight recruits for participation in special programs to mitigate adjustment problems they might face.

The condition of being overweight is characterized in terms of bodymass, a concept used in the medical and epidemiological literature. Bodymass combines height and weight into a common metric that correlates well with more comprehensive measures of body fat. If physical standards for enlistment in the Services were very restrictive, then observed differences in bodymass among recruits would be unlikely to affect attrition, because the standards would screen out the high-risk categories. Alternatively, if standards were lax, then bodymass would vary substantially across a cohort of recruits, and some high-bodymass recruits might have high attrition rates.

MILITARY VERSUS MEDICAL WEIGHT STANDARDS

Military criteria for overweightedness differ from common medical and epidemiological standards (Stewart, Brook, and Kane, 1980; National Institutes of Health, 1985). The epidemiological standard defines men as overweight if their bodymass index is equal to or greater than 26 kg (in weight)/m^2 (in height). A woman is defined as medically overweight if her bodymass index is equal to or greater than 32 kg (in weight)/m (in height) to the 1.5 power. Military recruits may be medically

overweight and yet still be fit and eligible for Service. Cohorts of high-quality[1] male recruits range in bodymass index from 18 to 31 kg/m^2, with the average index at about 23. Cohorts of female high-quality recruits range in bodymass index from 22 to 31 $kg/m^{1.5}$, with the average at 28.

The physical standards used by the Services have a differential effect on enlistment eligibility by gender. As Fig. 1 shows, military standards exclude five times as many women as men in the general 17- to 22-year-old population.[2] By comparison, common medical definitions of overweight would characterize about 14 percent of both men and women in this youth population as overweight. This contrast between military and medical standards means that male recruits constitute a much broader range of weight variation from the general population than female recruits. Current physical standards are much less restrictive for men than for women, so any relationship between bodymass and attrition among current recruits should be stronger for men than for women.

Differences between medical and military weight standards reflect the fact that the standards are designed for different purposes. The medical standards are used to screen health risks, and the military standards are used to screen out potential recruits who are unlikely to meet the physical demands of military service. Because these objectives are only loosely related, some differences in the standards are reasonable and appropriate. The medical standard might be inappropriately restrictive or unrestrictive for military purposes, but the medical standard does provide some benchmark against which to compare the military standard.

---

[1]High-quality refers to recruits who are high school diploma graduates and who score above the 50th percentile on the Armed Forces Qualification Test (AFQT). The Services have strived for more high-quality recruits because high-quality recruits are easier to train and more likely to complete their enlistment term than low-quality recruits.

[2]Physical standards differ slightly by Service (Laurence, 1987). The ineligible percentages in Fig. 1 reflect the percentages of the general 17- to 22-year-old population that are ineligible for each Service weighted by their share of high-quality accessions. For men, Air Force weight standards exclude 7 percent of the population compared with 3 percent of the population excluded by the standards in the other three Services. Women's weight standards differ more across Services than men's, with 23, 19, 18, and 19 percent of the women's population excluded from the Army, Navy, Air Force, and Marine Corps, respectively. The calculations are based on a nationally representative sample of the 17- to 22-year-old population from the National Health and Nutrition Examination Survey 1976–1980 (NHANES II) (U.S. Dept. of Health and Human Services, 1982).

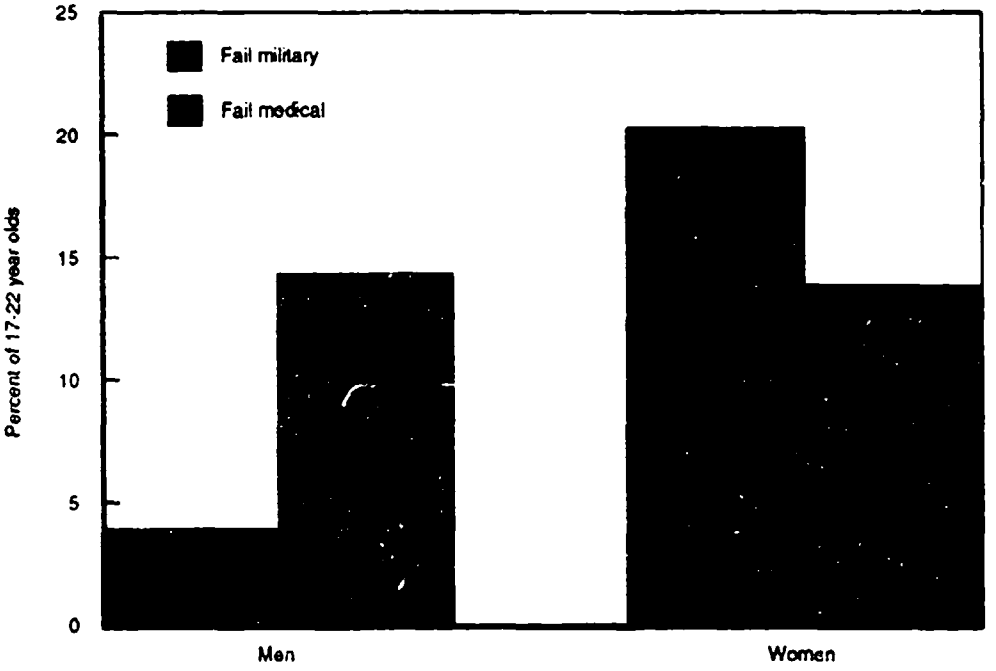

Fig. 1—Weight ineligibility differs by gender

How does the weight distribution of the civilian 17- to 22-year-old population compare with that of military accessions? Figure 2 shows that the percent of medically overweight male accessions is greater in each Service than in the population as a whole.[3] Air Force physical standards are more restrictive for men than those of the other Services, so a smaller share of Air Force accessions are overweight and most of those are within 10 pounds of the medical standard. Army, Navy, and Marine Corps male accessions are substantially more likely to be overweight than civilians with 7 to 8 percent of accessions more than 20 pounds over the medical standard.

Among women, Fig. 3 shows that only about 1 percent of accessions are medically overweight compared with 14 percent of the general 17- to 22-year-old

[3]In Figs. 2 and 3, the civilian percentages are based on the sample of civilians in the 17- to 22-year-old population in NHANES II. The percentages of military accessions are based on high-quality accessions for FY82 through FY85. The Services sometimes waive weight standards for recruits who are within 5 or 10 pounds of the standard, and Figs. 2 and 3 reflect actual accessions rather than the nominal standard.

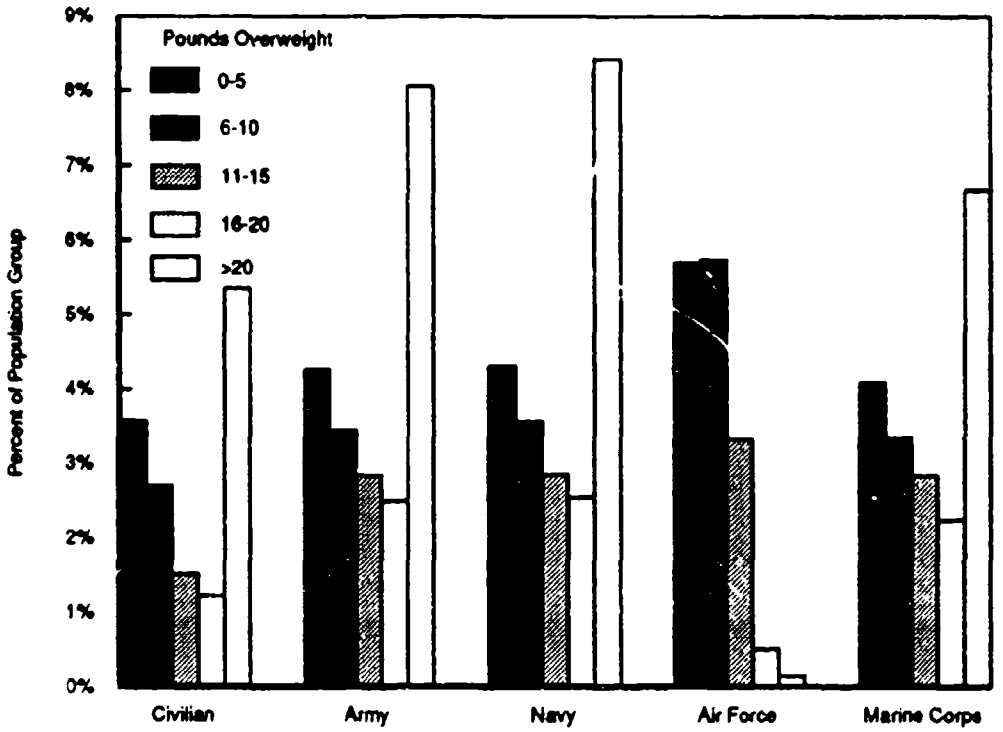

Fig. 2—Distribution of medically overweight men for civilians and Services

population. The Services contain few women who are over the medical weight standard, and most of those are within 5 pounds of the medical standard.

RESEARCH APPROACH

The main objective in this analysis is to determine whether attrition rates vary with recruit bodymass. The results are an unexpected outcome of a broader study of attrition trends among high-quality military recruits.[4] Logistic regression was used to examine how individual recruit characteristics, Service, training base and occupational assignments, and entry cohort affected attrition. The database is based on the non-prior Service cohort files maintained by the Defense Manpower Data Center. The cohort files contain information on individual age at accession, race, education level, AFQT score,

[4]Buddin, 1988. The broader report provides complete documentation of the database, statistical methodology, and results; this Note concentrates on the specific relationship between recruit weight (bodymass) and attrition.

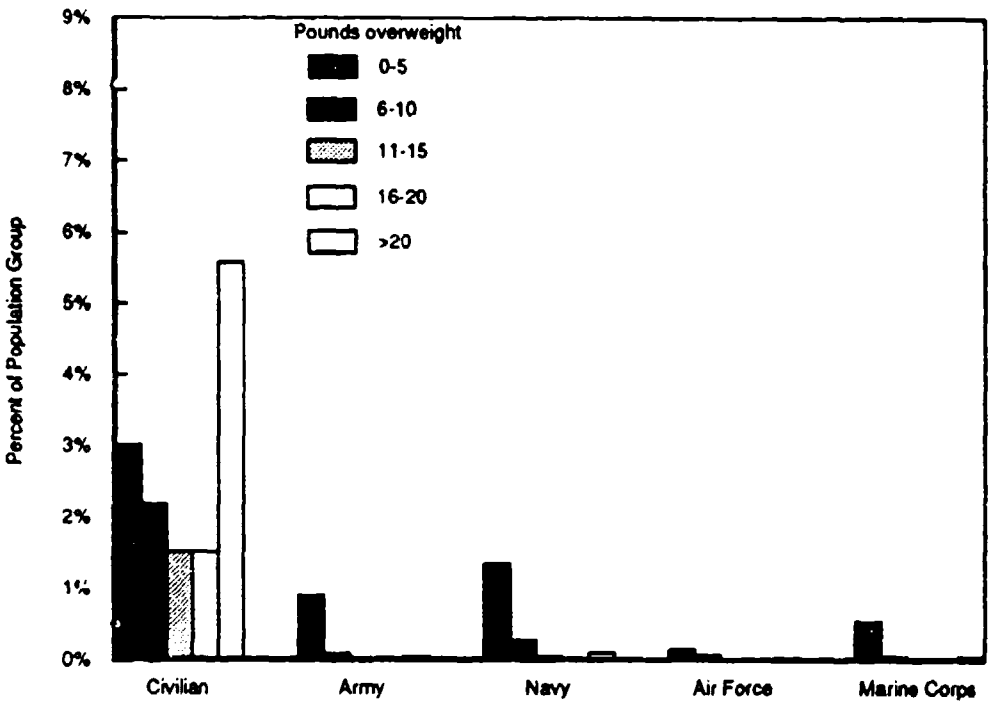

Fig. 3—Distribution of medically overweight women for civilians and Services

and height and weight. That height and weight information was used to compute the variable bodymass. The study focuses on the high-quality group because they are a fairly homogeneous group with sufficiently high aptitude to be effective in most military jobs.

Our database contains all high-quality accessions between FY82 and FY85, but follow-up attrition information was available only through September 30, 1985. Of recruits in the FY82 through FY85 cohorts, only the FY82 cohort had significant numbers of recruits who had reached the end of their enlistment term. Post-training losses are compared at intervals with comparable time at risk. Post-training losses in the first year of service are compared for the FY82 through FY84 cohorts. Post-training losses in the second year of service are compared for the FY82 and FY83 cohorts.

A multivariate approach was used to isolate the effect of bodymass on attrition rates from other factors, such as age and aptitude, that might be correlated with bodymass. Separate regression analysis was performed by Service, gender, entry cohort,

and training phase. Bodymass effects might differ by Service both because physical enlistment standards differ across Services and because some Services might be more physically demanding than others. Men and women are analyzed separately because weight standards were less restrictive for men than women and because women have much higher attrition rates than men. These factors suggested separate specifications so that statistical parameters were not constrained across genders. Separate equations were estimated by entry cohort to assess whether Service policy changes had any affect on the relationship between bodymass and attrition. Finally, attrition patterns were examined during basic training, technical training (advanced individual training or AIT in the Army), and post-training phases of the enlistment term. Weight problems were expected to have more pronounced effects on attrition during early training phases of the term, because of the specific physical demands of this training and because "overweight" survivors of basic and technical training have demonstrated their ability to compete physically with other recruits.

CONCLUSIONS

A major new finding of this research is that medically overweight young men have much higher training attrition rates than recruits who have no weight problems. In the Army and Marine Corps, some of these overweight men have basic training attrition rates that are two to three times as large as those of the average recruit. Overweight men do not fare as badly in the Navy and Air Force, but they do have attrition rates several percentage points above average. Weight differences among women enlistees have little effect on their attrition rates, in part perhaps because current physical standards are much more restrictive for women than for men.

ORGANIZATION

Statistical results are summarized for the Army, Navy, Air Force, and Marine Corps, respectively, in the next section. Within each Service, the Note discusses the effect of recruit bodymass on attrition at three phases: basic training, technical training,

and post-training. Separate results are reported for men and women. A final section draws together the conclusions and policy implications of the analysis. The statistical model and regression coefficients are reported in Appendix A.[5]

---

[5]Coefficients are reported for the bodymass terms only in the various regression specifications. A complete listing of coefficients for other variables in the model is found in Buddin, 1988.

II. BODYMASS AND ATTRITION

Tables 1 and 2 show the bodymass distribution of high-quality military accessions from FY82 through FY85 and the corresponding bodymass distribution of the 17- to 22-year-old civilian population. Among men, upper weight categories are overrepresented in the accession population relative to their civilian counterparts. The Air Force is somewhat anomalous, because Air Force standards are more restrictive on upper bodymass groups than those of the other Services. About 14 percent of the male civilians are medically overweight compared with about 20 percent of military recruits. The percentage of medically overweight Air Force recruits is below that of the other Services at 16 percent.

Among women, very few recruits are medically overweight, and the weight distribution across Services is very similar. About 1 percent of female DoD recruits are

Table 1

MALE BODYMASS DISTRIBUTION IN CIVILIAN AND SERVICE POPULATIONS
(Percent in each bodymass category)

Bodymass	Civilian	Army	Navy	Air Force	Marine Corps	All DoD
<18	2	1	2	2	1	1
18	4	4	4	4	4	4
19	8	7	8	8	7	8
20	14	11	11	12	12	12
21	16	13	12	13	13	13
22	14	13	13	14	14	13
23	12	12	11	12	12	12
24	7	10	9	10	10	10
25	7	7	8	9	8	8
26	4	6	6	8	5	6
27	3	4	4	7	4	5
28	2	3	3	1	3	3
29	1	3	3	0	3	2
30	1	3	3	0	3	2
31	1	1	1	0	1	1
32	1	0	0	0	0	0

NOTE: For men, bodymass is measured in kg/m^2. Men are medically overweight if their bodymass is greater than or equal to 26 kg/m^2. Civilian data are based on NHANES II, and military data are based on FY82-FY85 high-quality accessions.

medically overweight. Although nominal weight standards are less restrictive in the Air Force than in the other Services, only 0.4 percent of female Air Force recruits are medically overweight. This surprising result reflects the fact that nominal weight standards are less frequently waived in the Air Force than in the other Services.

Table 3 shows the average bodymass for male and female recruits by entry cohort and Service. The Services did not make changes in their weight standards over these cohorts, so the averages change very little from year to year. The Air Force standards for men were somewhat more restrictive than the standards of the other Services, so it is not surprising that the average bodymass of an Air Force male recruit is lower than that of DoD males. Average bodymass for women does not vary systematically across either Service or cohort.

Within each Service, overall attrition rates vary considerably across training phase, cohort, and gender. Tables 4 and 5 show that attrition rates are consistently higher *per time at risk* during basic training than at other times in the enlistment term. Basic

Table 2

FEMALE BODYMASS DISTRIBUTION IN CIVILIAN AND SERVICE POPULATIONS
(Percent in each bodymass category)

Bodymass	Civilian	Army	Navy	Air Force	Marine Corps	All DoD
<22	3	0	1	1	1	1
22	3	4	3	3	3	3
23	6	6	5	5	5	5
24	10	8	7	7	8	7
25	16	10	10	10	10	10
26	14	12	11	12	11	12
27	10	12	11	12	12	12
28	9	15	13	15	15	15
29	9	18	18	17	18	18
30	5	11	14	14	13	13
31	3	4	5	2	3	4
32	3	1	1	0	1	1
33	2	0	0	0	0	0
34	1	0	0	0	0	0
35	2	0	0	0	0	0
≥36	4	0	0	0	0	0

NOTE: For women, bodymass is measured in $kg/m^{1.5}$. Women are medically overweight if their bodymass index is greater than or equal to 32. Civilian data are based on NHANES II, and military data are based on FY82-FY85 high-quality accessions.

Table 3

MEAN BODYMASS BY SERVICE AND ACCESSION COHORT

Cohort	Army	Navy	Air Force	Marine Corps
		Men		
FY82	23.51	23.45	22.87	23.31
FY83	23.36	23.35	22.83	23.18
FY84	23.38	23.41	22.83	23.34
FY85	23.80	23.84	23.20	23.81
		Women		
FY82	27.74	27.74	27.57	27.61
FY83	27.55	27.75	27.54	27.44
FY84	27.49	27.66	27.55	27.50
FY85	27.51	27.86	27.71	27.79

training (BT) lasts about two months and provides an initial military orientation, regimentation, and physical fitness training. Following BT, most recruits receive formal technical training (advanced individual training, or AIT, in the Army) in their occupational specialty. Technical training varies from one to about nine months, depending upon the sophistication of the training required. After training, recruits are assigned to units.

Attrition rates have varied somewhat for high-quality personnel in the training phases, particularly the attrition rates during basic training. In the Army, BT rates for men varied over a range of 3 percentage points on a base rate of 6 percent. BT rates varied over a range of 1.6 percentage points in both the Navy and Air Force on base rates of 5.9 and 5.2 percent, respectively. Women's BT rates fell 4.9 percentage points between FY83 and FY85, and the rate for Air Force women rose 3.0 percentage points.

ARMY

Basic Training

Figure 4 shows that BT attrition rates for men vary considerably with their bodymass; recruits with bodymass of 31 (the upper end of the eligible range) have attrition rates almost three times those of the average recruit whose bodymass is about 23. Men who are at the medical weight standard of 26 kg/m^2 have BT attrition rates of 6.2 percent compared with a rate of 5.0 percent for the average recruit with a bodymass

Table 4

ATTRITION LEVELS FOR MEN BY SERVICE, TRAINING PHASE, AND COHORT
(Attrition percentages)

Training Phase	FY82–FY85	FY82	FY83	FY84	FY85
		Army			
Basic Training	6.0	6.1	7.2	5.9	4.2
AIT	2.1	2.6	2.3	1.9	1.4
Post-Training					
One-Year	4.2	4.6	3.9	4.2	
Two-Year	10.1	10.8	9.6		
		Navy			
Basic Training	5.9	5.2	5.8	6.1	6.8
AIT	1.5	1.3	1.5	1.4	1.6
Post-Training					
One-Year	2.2	2.2	2.0	2.3	
Two-Year	7.3	7.6	7.1		
		Air Force			
Basic Training	5.2	5.1	4.3	5.8	5.9
AIT	2.5	3.0	2.7	2.4	1.9
Post-Training					
One-Year	1.9	2.3	1.9	1.7	
Two-Year	6.5	7.0	6.0		
		Marine Corps			
Basic Training	10.4	10.9	10.6	10.0	10.0
AIT	2.3	2.3	2.1	2.3	2.3
Post-Training					
One-Year	2.2	1.9	2.3	2.3	
Two-Year	7.0	7.1	6.9		

of 23. Over 20 percent of the high-quality male recruits exceed this standard, and their loss rates are markedly higher than those of men not exceeding the medical standard.

The relationship between bodymass and attrition has diminished somewhat in FY85 relative to earlier cohorts. Figure 5 shows that the FY85 cohort had a much lower overall rate and that FY85 recruits with high bodymass did much better relative to those with average bodymass. For example, in FY85, loss rates for recruits with a bodymass of 31 are twice the average compared with the situation in previous years when they had been three times the average. This improvement is an indication that a new Army attrition program, begun in December 1984, may be reducing the loss rates of overweight trainees. A major facet of the program (Buddin, 1988; Trainee Discharge Program Study

Table 5

ATTRITION LEVELS FOR WOMEN BY SERVICE, TRAINING PHASE, AND COHORT
(Attrition percentages)

Training Phase	FY82–FY85	FY82	FY83	FY84	FY85
		Army			
Basic Training	12.0	11.2	13.3	13.1	8.4
AIT	5.5	6.9	6.0	4.8	4.1
Post-Training					
One-Year	7.4	7.6	7.4	7.2	
Two-Year	17.3	17.7	17.0		
		Navy			
Basic Training	8.2	8.0	8.1	7.9	9.0
AIT	1.7	1.6	1.7	1.5	2.1
Post-Training					
One-Year	2.9	2.5	3.3	2.9	
Two-Year	9.8	9.4	10.2		
		Air Force			
Basic Training	8.0	7.4	6.2	9.1	9.2
AIT	2.8	3.6	2.5	2.8	2.4
Post-Training					
One-Year	3.5	3.7	3.7	3.2	
Two-Year	10.6	9.9	11.2		
		Marine Corps			
Basic Training	13.8	12.5	12.9	15.0	15.0
AIT	3.4	4.2	4.1	2.9	2.4
Post-Training					
One-Year	4.3	4.4	3.7	4.6	
Two-Year	16.3	17.6	14.9		

Group, 1984) was a remedial prebasic physical fitness program for recruits who did not meet minimum fitness standards when they arrived at the basic training center. This program might be helping some of the medically overweight recruits who are not in adequate physical condition for basic training. Another possibility is that command pressure to reduce BT attrition rates is manifesting itself in fewer losses because of weight problems. This would occur if commanders found it easier to deal with physical fitness problems than with other disciplinary or performance problems. It remains to be seen whether the trend will continue in future cohorts, or whether those recruits who

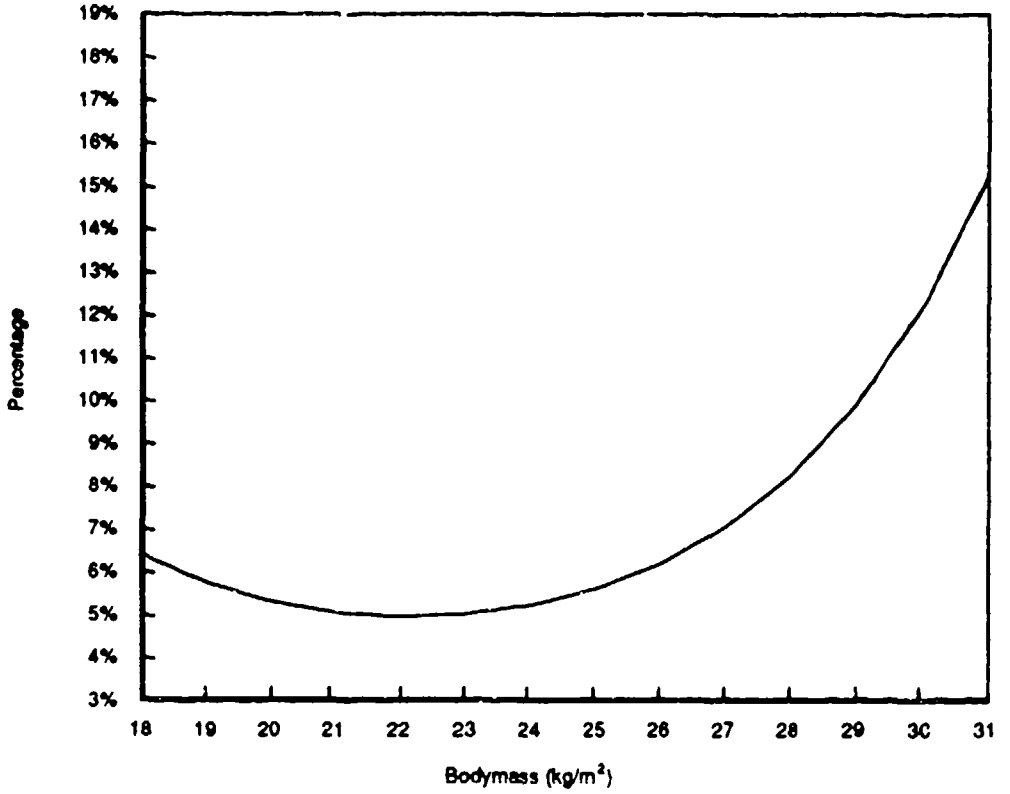

Fig. 4—BT attrition and bodymass for high-quality Army men, FY82–FY85

entered with weight problems will subsequently have higher loss rates later in their enlistment term.[1]

The weight standards for women are very restrictive, so the weight distribution of women allowed to enlist is much narrower than for men. However, the Army has not stringently enforced the weight standard for women, and 25 percent of high-quality female recruits exceeded the standard in FY82. This percentage has declined substantially in more recent cohorts, but the Army still allowed 10 percent of high-quality female recruits to exceed standards in FY85. Enforcement of the standard has been lax, but few women allowed to enlist are overweight by medical standards (a bodymass index of 32 $kg/m^{1.5}$). Although 21 percent of male recruits are medically overweight, only 1 percent of the female recruits exceed the medical standard. Consequently, it is not surprising that BT loss rates for women do not vary much with

[1]Our database reflects attrition as of October 1, 1985, so we cannot assess the post-training attrition behavior of the FY85 cohort.

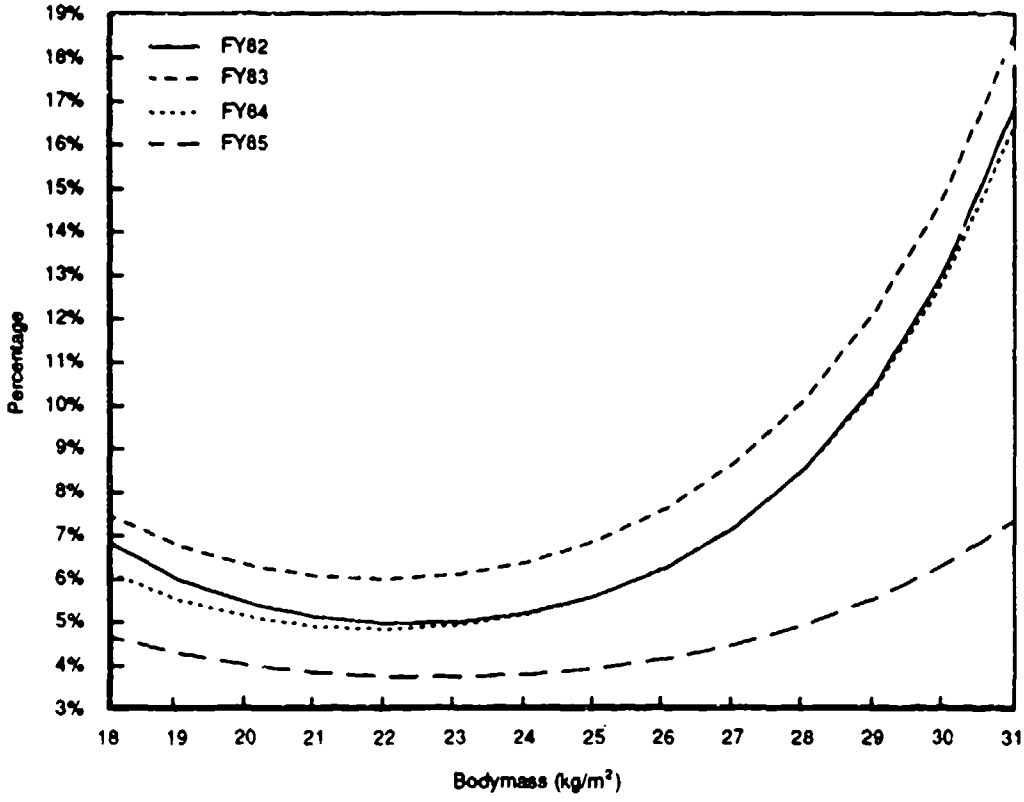

Fig. 5—BT attrition and bodymass for high-quality Army men by cohort, FY82–FY85

bodymass. Bodymass has an inconsistent effect on women's attrition in different cohorts, with no significant relationship present in FY83 and FY85. Over all four cohorts, Fig. 6 shows that the BT attrition rates of women at the upper range of bodymass among new recruits is about 2 percentage points higher than the overall average of 11.6. Women who exceed the enlistment standard but are allowed to enlist do not have BT attrition rates significantly above the average rate for those who meet the standard.

Advanced Individual (Technical) Training

Overweightedness among men is associated with increased risk of AIT attrition. Figure 7 describes the relationship between AIT attrition and bodymass over all four cohorts. The relationship between overweight and AIT attrition in different cohorts parallels that relationship in BT. In the FY82 through FY84 cohorts, attrition rates among those on the upper end of the bodymass eligible group have attrition rates about

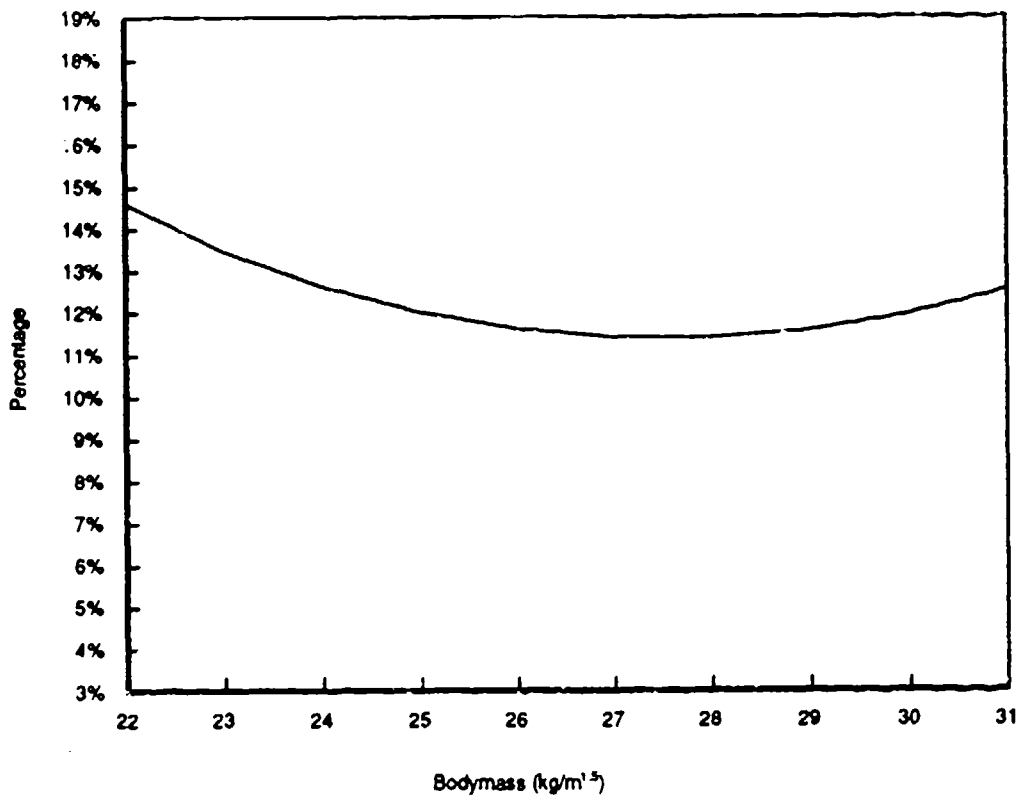

Fig. 6—BT attrition and bodymass for high-quality Army women, FY82–FY85

three times the average rates. In the FY85 cohort, there is no significant relationship between AIT attrition and bodymass. The new Army attrition program is apparently reducing the attrition rates of overweight recruits relative to nonoverweight recruits in both the BT and AIT training phases.

As was the case in BT, bodymass is of much less consequence in explaining women's AIT attrition. The bodymass coefficients are insignificant in FY83, FY84, and FY85, and they are significant only in FY82. Army women with a bodymass of 31 have predicted AIT attrition rates of 6.0 whereas those with an average bodymass of about 27.5 have an attrition rate of 5.2 percent.

Post-Training

Bodymass differences have no significant effect on women's post-training attrition, but overweight men have above average post-training attrition rates. Although statistically significant, however, bodymass does not have nearly as large an effect on men's post-training losses as it does on their training losses. Post-training losses of men

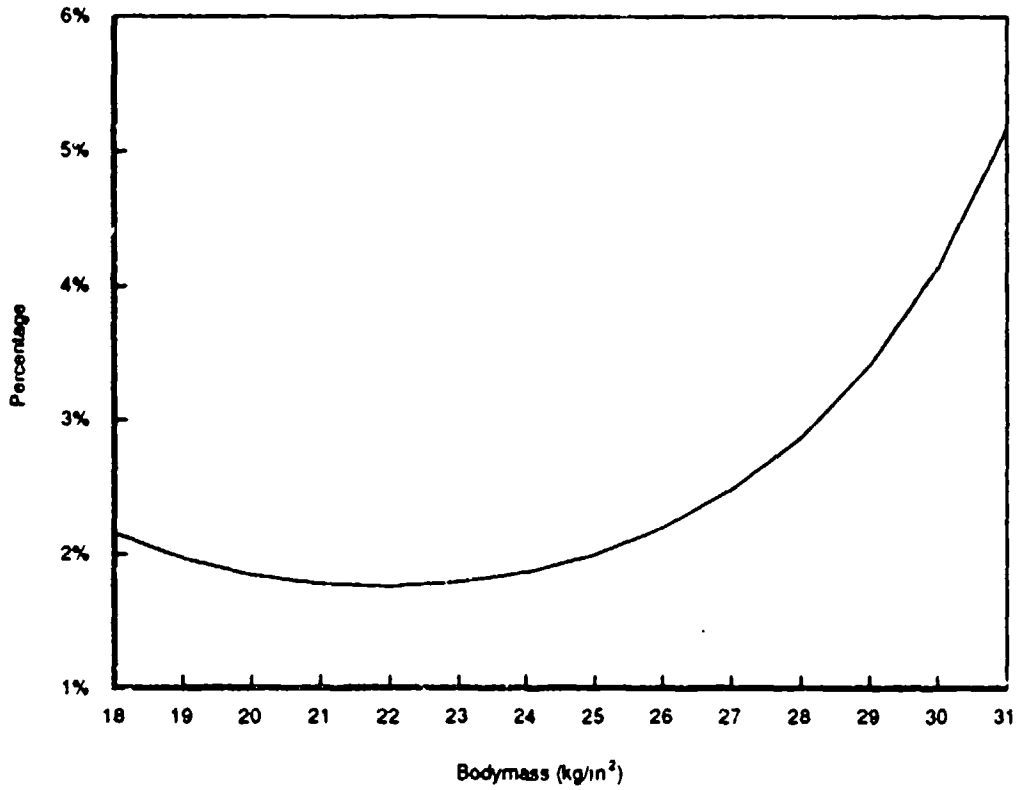

Fig. 7—AIT attrition and bodymass for high-quality Army men, FY82–FY85

at the upper end of the eligible range were about 1.25 times the average, whereas training losses at the upper end of the range were three times the average. Apparently, either the physical training in BT and AIT succeeds in weeding out those recruits with serious weight problems, or weight problems are less important in the less physically demanding post-training phase of the term.

The bodymass variable is based on entry height and weight, which may change during the BT and AIT physical training. Entrance bodymass is presumably highly positively correlated with subsequent post-training weight, but some recruits who entered overweight might not be overweight at the completion of training and vice versa. As a result, post-training bodymass effects might be distorted downward relative to what they would have been if we had measured bodymass at the start of the post-training phase.

NAVY

Basic Training

As in the Army, BT attrition rates of Navy men differ markedly with recruit bodymass. About 22 percent of the Navy men recruited between FY82 and FY85 had bodymass greater than or equal to the epidemiological standard of 26 kg/m^2. Figure 8 shows that these overweight recruits had BT attrition rates substantially above average. Those men on the upper end of the military eligible group (bodymass of 31) had BT attrition rates about 4 percentage points higher than those with average bodymass. The relationship between bodymass and BT attrition was similar in all four cohorts.

The BT loss rate of Navy women does not vary significantly with bodymass except in the FY85 cohort, when women at the upper extreme of the bodymass range had BT loss rates about 2.5 percentage points higher than women recruits of average bodymass. Although Navy standards are more restrictive for women than for men, enforcement of the standards has been lax. In each year, 20 to 25 percent of the women recruited exceeded the nonimal Navy weight standard, although only 1.8 percent of the women recruited during these years were medically overweight. Average BT loss rates among those women who exceed the military weight standard are not significantly different from the average for those who meet the standard.

Technical Training

Bodymass has no significant effect on techinical training attrition rate of Navy men or women. Apparently, weight problems are either corrected in BT (through attrition or physical conditioning) or are less important in the less physically demanding phases of the enlistment term.

Post-Training

Bodymass has no significant effect on post-training attrition of either men or women. Perhaps BT training was successful in weeding out recruits with serious weight problems. Alternatively, post-training duties are probably less physically demanding than those in BT, so weight problems are less important in this enlistment phase.

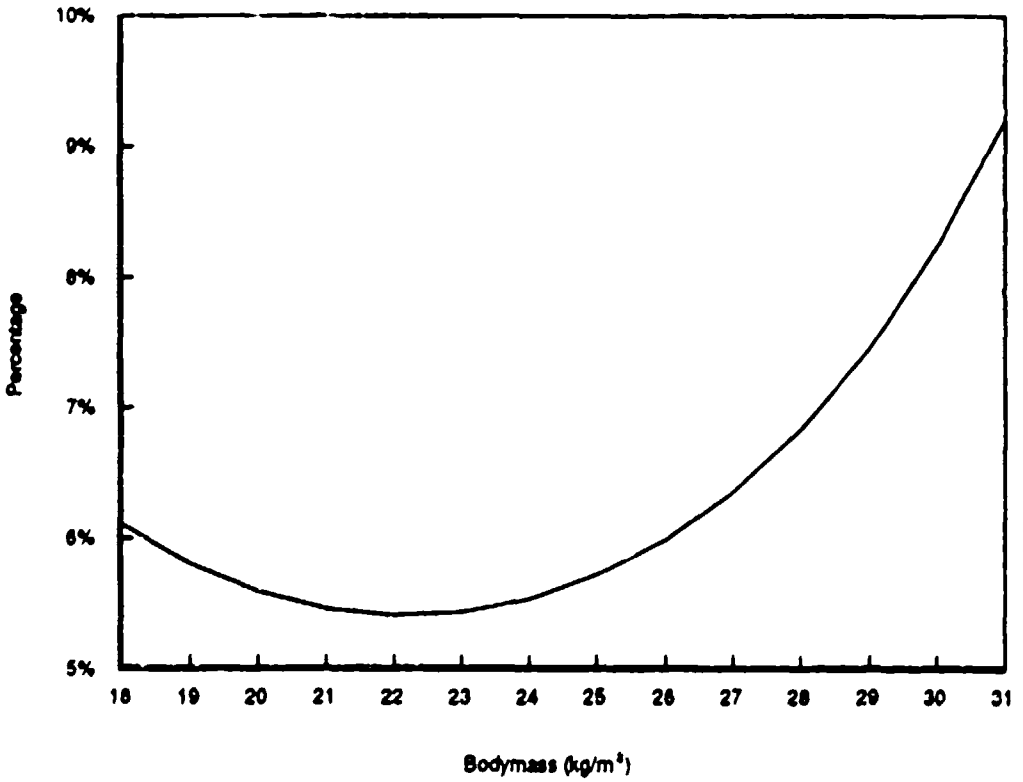

Fig. 8—BT attrition and bodymass for high-quality Navy men, FY82–FY85

AIR FORCE

Basic Training

As in other Services, young men joining the Air Force are much less likely to successfully complete basic training if their bodymass is above average. Figure 9 shows that men at the upper end of the eligible group have basic attrition rates 3 percentage points higher than the average male recruit, who has a bodymass of 23 kg/m^2. About 15 percent of the high-quality Air Force men in each cohort are overweight by the epidemiological standard of bodymass equal to or in excess of 26 kg/m^2.[2]

Unlike the situation in the Army and Navy, basic training attrition rates of Air Force women have not varied significantly with bodymass in any cohort group. Because

[2]The Air Force recruited leaner high-quality men in recent years than the other Services. The mean bodymass for high-quality men in the FY82-FY85 cohorts is as follows: Army 23.5; Navy 23.5; Air Force 22.9; and Marine Corps 23.4. A representative 6 foot tall male recruit in the Air Force weighs 5 pounds less than a comparable recruit in the other Services.

weight standards for women are much more restrictive than for men, we did not expect bodymass differences would be of much consequence for women. Although no Service has many women recruits who exceed the medical weight standard, less than 0.5 percent of Air Force women recruited during this period exceeded the medical standard, and the range of bodymass for women in the Air Force is more restricted than that of any other Service.

Technical Training

Differences in bodymass have no significant effect on technical training attrition of men or women. Physical standards are sufficiently restrictive for women that bodymass differences had no significant effects in basic training, so it is not surprising that this factor is also insignificant in the less physically demanding technical training. For men, the Air Force is apparently able to correct physical problems in BT either by weeding out overweight recruits or assisting them in achieving an adequate level of fitness for subsequent Air Force duty.

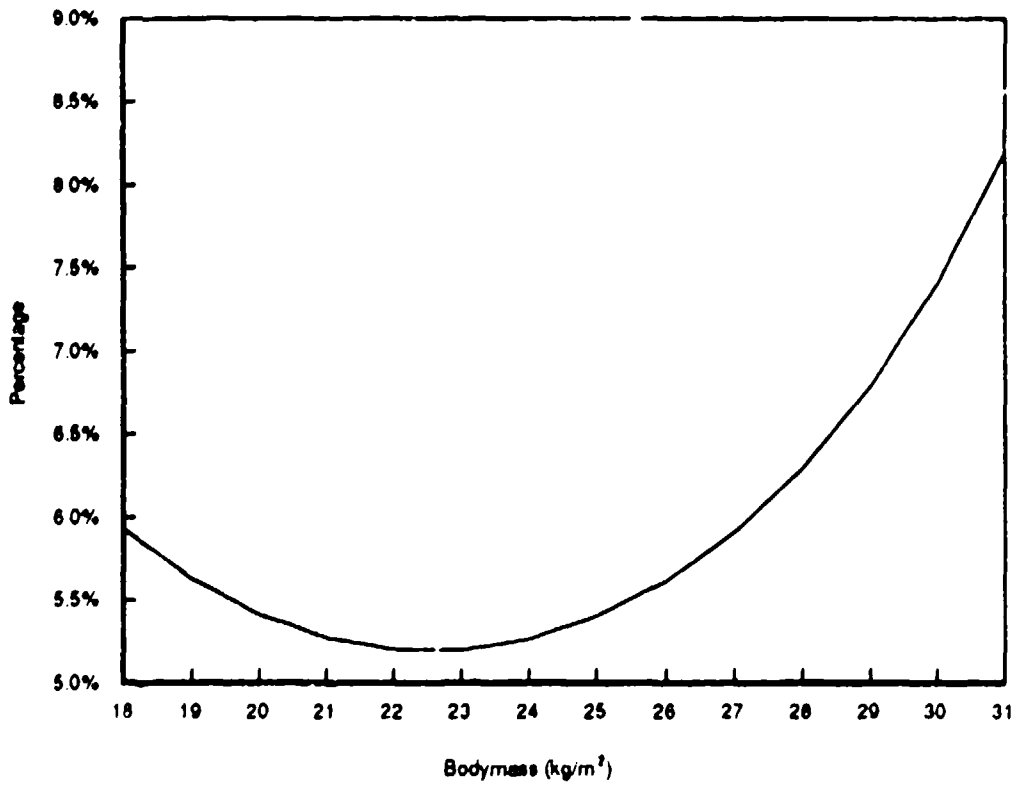

Fig. 9—BT attrition and bodymass for high-quality Air Force men, FY82–FY85

Post-Training

In the Air Force, bodymass differences play out their effects quickly during basic training. Post-training attrition rates of men and women are unaffected by differences in their enlistment bodymasses.

MARINE CORPS

Basic Training

As in the other Services, bodymass differences of Marine Corps men have an important effect on BT attrition rates. About 19 percent of high-quality male Marine Corps recruits in recent cohorts have been overweight by epidemiological standards. Figure 10 shows that BT attrition rates rise sharply with bodymass. Men whose bodymass is less than the medical weight standard of 26 kg/m^2 have only modest differences in their predicted BT attrition rates. Beyond the cutoff, the attrition rate rises sharply. At the upper end of the eligible range, the attrition rate is nearly 3 times that for average weight recruits with the probability of BT failure at 25 percent. The pattern of BT attrition rate differences by bodymass for men is similar in all four cohorts.

Although written physical standards for women are very restrictive, enforcement is rather lax: About 20 percent of the Marine women each year exceed the nominal Marine Corps standard. Nonetheless, only 1 percent of the women recruits are overweight by the medical or epidemiological standard. BT attrition rates do not differ significantly with bodymass over the range of women allowed to enlist in the Marine Corps.

Technical Training

As expected, bodymass differences have no significant effect on technical training attrition of Marine Corps women. However, bodymass remains an important factor affecting technical training attrition rates of Marine men. Figure 11 shows that overweight men have technical training attrition rates several times those of the average recruit. The probability that a recruit with bodymass of 31 will complete BT and AIT both is only 65 percent, compared with a training completion rate of 90 percent for a recruit with average bodymass of 23.

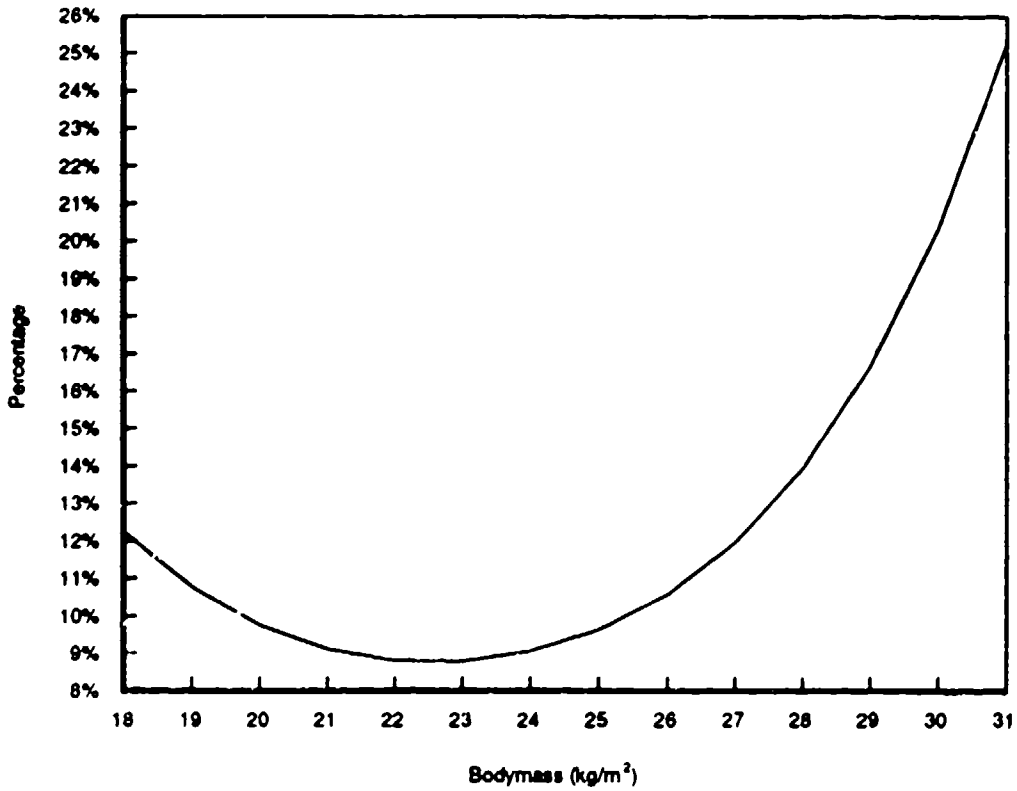

Fig. 10—BT attrition and bodymass for high-quality Marine Corps men, FY82–FY85

Post-Training

The effect of bodymass on post-training attrition in the Marine Corps is insignificant for both men and women. Bodymass was not expected to affect post-training attrition of women because of the restrictive physical standards and because it was not a significant factor in explaining women's attrition during the physically demanding training phase. By the post-training phase, initially overweight recruits have either overcome their physical problems, or any remaining weight problems are less binding because the post-training phase is less physically demanding than training.

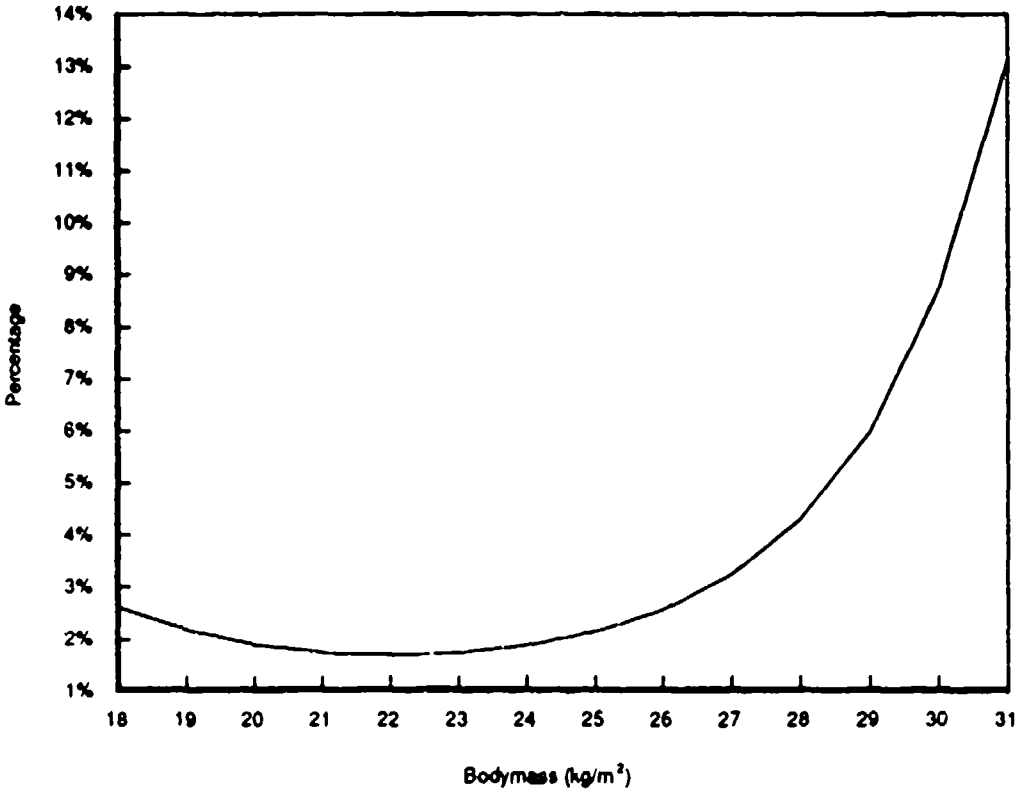

Fig. 11—Technical training attrition and bodymass for high-quality Marine Corps men, FY82–FY85

III. CONCLUSIONS

This research has shown that many medically overweight men who enlist under current physical standards are high attrition risks, particularly during basic training. In the Army and Marine Corps, some of the overweight men have basic training attrition rates that are two to three times as large as those of the average weight recruit. Overweight men do not fare as badly in the Navy and Air Force, but they do have attrition rates several percentage points above average. About 20 percent of DoD high-quality male accessions are overweight by medical standards, so high loss rates in this group constitute an area of important policy concern.

The Services should consider some changes in physical standards and evaluate whether special programs might be cost-effective in mitigating the attrition problems of overweight men in the military. Tighter male physical standards could substantially reduce the military eligible enlistment pool, thereby either increasing the cost of recruiting the desired number of high-quality soldiers or filling a larger portion of the enlistment requirement with low-quality personnel who satisfied the new physical standard. High-quality, medically overweight male accessions may be no greater attrition risks than their potential low aptitude or nongraduate replacements in a regime of tighter physical standards.

Further research is needed to isolate the specific reasons for high attrition rates among medically overweight recruits and to investigate whether these recruits could be targeted with special attention to ease their attrition problems. Although the evidence is not conclusive, Army experience suggests that special programs might substantially diminish the attrition rates of overweight recruits. Changes in Army attrition management and practices have reduced the training attrition rates of overweight men in FY85 below those of many nonoverweight men in earlier cohorts. Although overweight men still have above average training attrition rates, there has been a large relative improvement under the new policies. The Army experience highlights the importance of evaluating a change in recruitment standards in the context of other institutional changes in practices. Under FY85 policies and practices, tighter physical standards would presumably reduce training attrition rates by less than the standards in FY83 policies and practices. Unfortunately, we cannot document why overweight men did relatively better in FY85, so we cannot predict whether the change will continue.

Weight differences among women enlistees have little effect on their attrition rates. Current physical standards are much more restrictive for women than for men, so that only about 1 percent of female accessions are medically overweight compared with about 20 percent of male accessions. Most medically overweight female accessions are within 5 pounds of the medical standard, so it is impossible to evaluate whether substantially overweight women would have above average attrition rates. Although very few female accessions are medically overweight, 10 to 20 percent of female accessions exceed the Service's nominal weight standards. Lax enforcement of the nominal military weight standards for women has not resulted in a significant increase in their attrition rates.

Appendix A

STATISTICAL MODEL

Attrition is examined in each Service, gender, and training phase by means of logistic regression, where

$$\text{Prob}\{Y_i = 1 \mid X_i\} = 1/[1 + \exp(-X_i\beta)]$$

represents the probability that the *i*th individual recruit with characteristics X_i will be discharged. In this equation, X_i is a $1 \times (k + 1)$ vector, β is a $(k + 1) \times 1$ vector of estimated parameters, and k denotes the number of estimated individual characteristics.[1] Individual separation is modeled as a function of individual characteristics as well as Service attributes such as occupational and base assignment. Within each Service, gender, and training phase, cohort effects are examined with both a fixed effect and a full effects model. The fixed effect model has separate intercepts for each cohort but constrains parameters for other individual and Service factors to be equal across cohorts. The full effects model estimates a full set of parameters for each cohort separately. This approach facilitates the comparison of base and individual effects across cohorts. In the logistic regression model, the marginal effect of the *j*th characteristic on the probability of attrition is $\beta_j P(1 - P)$, where *P* is the mean attrition probability for the Service, gender, training phase, and cohort group.

---

[1]Logistic regression is used in lieu of a linear regression approach because the dependent variable (attrition versus nonattrition) is dichotomous and not continuous. As a result, the linear regression estimates are inappropriate because the variance of the dependent variable is a function of its expectation, and the predicted attrition estimates are not bounded by zero and one. These problems are avoided by the use of logistic regression. The logistic regression model is fitted by means of linear discriminant methodology (Haggstrom, 1983).

Appendix B

BODYMASS AND ARMY ATTRITION

Table B.1

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY ARMY MEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82-FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.69270**	–0.80791**	–0.67563**	–0.72125**	–0.47458**
Bodymass^2	0.01566**	0.01809**	0.01542**	0.01645**	0.01045**
Mean rate	0.060	0.061	0.072	0.059	0.042
Sample size	158580	36150	46462	48299	27669
		Advanced Individual Training			
Bodymass	–0.58605**	–0.53476**	–0.65470**	–0.76523**	–0.24701
Bodymass^2	0.01339**	0.01228**	0.01526**	0.01704**	0.00573
Mean rate	0.021	0.026	0.023	0.019	0.014
Sample size	148986	33931	43101	45454	26500
		One-Year Post-Training			
Bodymass	–0.17381**	–0.10377	–0.20331*	–0.20624*	
Bodymass^2	0.00368**	0.00224	0.00435*	0.00429*	
Mean rate	0.042	0.046	0.039	0.042	
Sample size	130911	36150	46462	48299	
		Two-Year Post-Training			
Bodymass	–0.23253**	–0.17769**	–0.28101**		
Bodymass^2	0.00485**	0.00374**	0.00585**		
Mean rate	0.101	0.108	0.096		
Sample size	82612	36150	46462		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Table B.2

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY ARMY WOMEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82-FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.50763**	–0.64437**	–0.20366	–0.77610**	–0.18927
Bodymass^2	0.00921**	0.01187**	0.00385	0.01412**	0.00225
Mean rate	0.120	0.112	0.133	0.131	0.084
Sample size	34177	7765	10420	10418	5574
		Advanced Individual Training			
Bodymass	–0.56129**	–0.88351**	–0.39381	0.04469	–1.04179
Bodymass^2	0.01037**	0.01600**	0.00697	–0.00033	0.01941
Mean rate	0.055	0.069	0.060	0.048	0.041
Sample size	30090	6894	9038	9053	5105
		One-Year Post-Training			
Bodymass	0.06242	0.27549	–0.15268	0.17531	
Bodymass^2	–0.00161	–0.00561	0.00262	–0.00394	
Mean rate	0.074	0.076	0.074	0.072	
Sample size	28603	7765	10420	10418	
		Two-Year Post-Training			
Bodymass	0.06297	0.29841	–0.13221		
Bodymass^2	–0.00126	–0.00561	0.00236		
Mean rate	0.173	0.177	0.170		
Sample size	18185	7765	10420		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Appendix C

BODYMASS AND NAVY ATTRITION

Table C.1

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY NAVY MEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82–FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.32702**	–0.52239**	–0.33395**	–0.18106*	–0.39069**
Bodymass^2	0.00737**	0.01143**	0.00782**	0.00432*	0.00831**
Mean rate	0.059	0.052	0.058	0.061	0.068
Sample size	105289	24646	29351	31183	20109
		Technical Training			
Bodymass	–0.17532+	0.00293	–0.07797	–0.40446*	–0.18369
Bodymass^2	0.00370+	0.00001	0.00189	0.00831*	0.00376
Mean rate	0.015	0.013	0.015	0.014	0.016
Sample size	99055	23374	27649	29294	18738
		One-Year Post-Training			
Bodymass	0.11940	0.11712	0.40373*	–0.11102	
Bodymass^2	–0.00322+	–0.00311	–0.00896**	0.00139	
Mean rate	0.022	0.022	0.020	0.023	
Sample size	85180	24646	29351	31183	
		Two-Year Post-Training			
Bodymass	0.02761	–0.10475	0.14554+		
Bodymass^2	–0.00108	0.00172	–0.00360*		
Mean rate	0.073	0.076	0.071		
Sample size	53997	24646	29351		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Table C.2

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY NAVY WOMEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82-FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.36190*	0.19732	–0.44628	–0.14597	–0.97197*
Bodymass^2	0.00629+	–0.00361	0.00774	0.00207	0.01745*
Mean rate	0.082	0.080	0.081	0.079	0.090
Sample size	16933	4094	4727	4298	3814
		Technical Training			
Bodymass	–0.05965	0.52211	0.21319	–0.69772	–0.49677
Bodymass^2	–0.00044	–0.01007	–0.00406	0.01300	0.00728
Mean rate	0.017	0.016	0.017	0.015	0.021
Sample size	15540	3767	4343	3960	3470
		One-Year Post-Training			
Bodymass	0.31266	0.39844	0.38171	0.01333	
Bodymass^2	–0.00643	–0.00799	–0.00771	–0.00086	
Mean rate	0.029	0.025	0.033	0.029	
Sample size	13119	4094	4727	4298	
		Two-Year Post-Training			
Bodymass	0.38359+	0.35881	0.39249		
Bodymass^2	–0.00738+	–0.00688	–0.00756+		
Mean rate	0.098	0.094	0.102		
Sample size	8821	4094	4277		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Appendix D

BODYMASS AND AIR FORCE ATTRITION

Table D.1

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY AIR FORCE MEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82-FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.30733**	–0.30469*	–0.29949+	–0.41256**	–0.19270
Bodymass^2	0.00682**	0.00668*	0.00684+	0.00917**	0.00418
Mean rate	0.052	0.051	0.043	0.058	0.059
Sample size	121450	30869	31782	33338	25461
		Technical Training			
Bodymass	–0.19880+	–0.46556*	–0.00690	–0.17545	–0.05747
Bodymass^2	0.00413+	0.00925*	0.00065	0.00401	0.00063
Mean rate	0.025	0.030	0.027	0.024	0.019
Sample size	115089	29305	30415	31420	23949
		One-Year Post-Training			
Bodymass	0.03163	0.04599	0.02273	0.02569	
Bodymass^2	–0.00129	–0.00173	–0.00107	–0.00101	
Mean rate	0.019	0.023	0.019	0.017	
Sample size	95989	30869	31782	33338	
		Two-Year Post-Training			
Bodymass	–0.06464	0.05905	–0.19956		
Bodymass^2	0.00096	–0.00158	0.00372		
Mean rate	0.065	0.070	0.060		
Sample size	62651	30869	31782		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Table D.2

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY AIR FORCE WOMEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82-FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.03117	0.09334	–0.28243	0.56952	–0.64939
Bodymass^2	–0.00038	–0.00199	0.00518	–0.01069	0.01158
Mean rate	0.080	0.074	0.062	0.091	0.092
Sample size	22750	4967	5893	6348	5542
		Technical Training			
Bodymass	–0.59822+	–0.61027	0.09033	–0.55573	–1.94773*
Bodymass^2	0.01150+	0.01157	–0.00236	0.01008	0.03700*
Mean rate	0.028	0.036	0.025	0.028	0.024
Sample size	20931	4601	5526	5771	5033
		One-Year Post-Training			
Bodymass	0.45677	0.80466	0.53373	–0.02080	
Bodymass^2	–0.00848	–0.01516	–0.00931	0.00012	
Mean rate	0.035	0.037	0.037	0.032	
Sample size	17208	4967	5893	6348	
		Two-Year Post-Training			
Bodymass	0.24148	0.13877	0.29640		
Bodymass^2	–0.00425	–0.00306	–0.00477		
Mean rate	0.106	0.099	0.112		
Sample size	10860	4967	5893		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Appendix E

BODYMASS AND MARINE CORPS ATTRITION

Table E.1

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY MARINE CORPS MEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82–FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.79913**	–0.75528**	–0.72176**	–0.77316**	–1.04676**
Bodymass^2	0.01770**	0.01688**	0.01617**	0.01720**	0.02255**
Mean rate	0.104	0.109	0.106	0.100	0.100
Sample size	56507	13663	15267	17029	10548
		Technical Training			
Bodymass	–1.19616**	–1.42272**	–1.20360**	–1.19323**	–0.89980**
Bodymass^2	0.02713**	0.03198**	0.02732**	0.02731**	0.02051**
Mean rate	0.023	0.023	0.021	0.023	0.023
Sample size	50634	12172	13646	15322	9494
		One-Year Post-Training			
Bodymass	0.06530	–0.14599	0.15600	0.11079	
Bodymass^2	–0.00196	0.00200	–0.00382	–0.00270	
Mean rate	0.022	0.019	0.023	0.023	
Sample size	45959	13663	15267	17029	
		Two-Year Post-Training			
Bodymass	–0.08646	–0.18950	0.00908		
Bodymass^2	0.00174	0.00373	–0.00013		
Mean rate	0.070	0.071	0.069		
Sample size	28930	13663	15267		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

Table E.2

LOGISTIC REGRESSION COEFFICIENT SUMMARY FOR HIGH-QUALITY MARINE CORPS WOMEN BY COHORT AND TRAINING PHASE

	Accession Cohort				
Variable	FY82–FY85	FY82	FY83	FY84	FY85
		Basic Training			
Bodymass	–0.09853	–0.16937	0.19707	–0.76560	0.64493
Bodymass^2	0.00262	0.00400	–0.00218	0.01492	–0.01178
Mean rate	0.138	0.125	0.129	0.150	0.150
Sample size	6525	1687	1639	1729	1470
		Technical Training			
Bodymass	–0.83838	–0.38163	–1.55629	–0.27763	–2.54476
Bodymass^2	0.01620	0.00857	0.02896	0.00394	0.05020+
Mean rate	0.034	0.042	0.041	0.029	0.024
Sample size	5622	1476	1427	1470	1249
		One-Year Post-Training			
Bodymass	0.00665	–0.32921	0.28272	0.34784	
Bodymass^2	–0.00153	0.00387	–0.00709	–0.00688	
Mean rate	0.043	0.044	0.037	0.046	
Sample size	5055	1687	1639	1729	
		Two-Year Post-Training			
Bodymass	–0.64262+	–0.91001*	–0.02093		
Bodymass^2	0.01156+	0.01687*	0.00051		
Mean rate	0.163	0.176	0.149		
Sample size	3326	1687	1639		

NOTES: This table summarizes the coefficients for bodymass terms from a broader regression specification reported elsewhere (Buddin, 1988). Regression coefficients marked with a plus, a star, or a double star are significantly different from zero at the 10, 5, or 1 percent confidence level, respectively.

BIBLIOGRAPHY

Buddin, Richard, *Trends in Attrition of High-Quality Military Recruits*, The RAND Corporation, R-3539-FMP, August 1988.

Haggstrom, Gus W., "Logistic Regression and Discriminant Analysis by Ordinary Least Squares," *Journal of Business and Economic Statistics*, Vol. 1, No. 3, July 1983.

Laurence, Michael T., *Development of a Methodology for Establishing Joint Service Height and Weight Standards for Enlistment*, Defense Manpower Data Center, Arlington, Virginia, November 1985.

Laurence, Michael T., *Enlistment Height and Weight Standards: Historical and Service-Specific*, Defense Manpower Data Center, Arlington, Virginia, March 1987.

Laurence, Michael T., *Enlistment Height/Weight Standards and Attrition from the Military*, Defense Manpower Data Center, Arlington, Virginia, April 1988.

National Institutes of Health, "Health Implications of Obesity," Consensus Development Conference Statement, Vol. 5, No. 9, Bethesda, Maryland, February 1985.

Stewart, Anita L., Robert H. Brook, and Robert L. Kane, *Conceptualization and Measurement of Health Habits for Adults in the Health Insurance Study: Vol. II, Overweight*, The RAND Corporation, R-2374/2-HEW, July 1980.

Trainee Discharge Program Study Group, *A Review and Analysis of the Army's Trainee Discharge Program*, United States Army Training and Doctrine Command, Ft. Monroe, Virginia, December 1984.

U.S. Department of Health and Human Services, *National Health and Nutrition Examination Survey, 1976–1980 (NHANES II)*, Public Health Service, National Center for Health Statistics, Hyattsville, Maryland, December 1982.